

Claims

- [c1] 1. An input protection circuit of a handheld electric device for protecting internal circuitry of the handheld electric device, the internal circuitry having a positive input node and a ground node, the input protection circuit comprising:
- a power socket having a positive input node and a ground node for electrically connecting two output nodes of a direct current (DC) power supply, the ground node of the power socket being electrically connected to the ground node of the internal circuitry;
 - a bipolar junction transistor (BJT) having an emitter electrically connected to the positive input node of the power socket, a collector electrically connected to the positive input node of the internal circuitry, and a base;
 - a metal-oxide semiconductor (MOS) transistor for controlling on and off of the BJT, the MOS transistor having a source electrically connected to the ground node of the internal circuitry, a drain electrically connected to the base of the BJT, and a gate; and
 - an overvoltage protective circuit having two input nodes and an output node for controlling on and off of the MOS transistor, the two input nodes being electrically connected to the positive input node and the ground node of the power socket, the output node being electrically connected to the gate of the MOS transistor;
- wherein when a reverse DC voltage or a DC voltage exceeding a threshold inputs from the positive input node and the ground node of the power socket, the overvoltage protective circuit will turn off the MOS transistor thereby turning off the BJT to prevent damages of the internal circuitry; and when a DC voltage below the threshold inputs from the positive input node and the ground node of the power socket, the overvoltage protective circuit will turn on the MOS transistor thereby turning on the BJT so as to input the DC voltage to the internal circuitry through the BJT.
- [c2] 2. The input protection circuit of claim 1 further comprising a diode electrically connected between the base of the BJT and the drain of the MOS transistor, wherein when the reverse DC voltage inputs from the positive input node and the ground node of the power socket, the diode will prevent a reverse parasitic

current of the MOS transistor from flowing into the base of the BJT so as to protect the BJT.

[c3] 3.The input protection circuit of claim 1 further comprising a high-resistance resistor electrically connected between the base of the BJT and the drain of the MOS transistor, wherein when the DC voltage below the threshold inputs from the positive input node and the ground node of the power socket, the resistor will greatly reduce a current flowing through the base of the BJT to the drain of the MOS transistor.

[c4] 4.The input protection circuit of claim 1 wherein the overvoltage protective circuit comprises:
a first resistor electrically connected between the positive input node of the power socket and the gate of the MOS transistor;
a first switch electrically connected between the gate of the MOS transistor and the ground node of the power socket; and
an overvoltage sensing circuit electrically connected between the positive input node and the ground node of the power socket for controlling the first switch;
wherein when the DC voltage exceeding the threshold inputs from the positive input node and the ground node of the power socket, the overvoltage sensing circuit will turn on the first switch to directly connect the gate of the MOS transistor with the ground node of the power socket so as to turn off the MOS transistor; and when the DC voltage below the threshold inputs from the positive input node and the ground node of the power socket, the overvoltage sensing circuit will turn off the first switch so as approximate a voltage at the gate of the MOS transistor to a voltage at the positive input node of the power socket thereby turning on the MOS transistor.

[c5] 5.The input protection circuit of claim 4 wherein the first switch is a transistor switch, the overvoltage sensing circuit comprising:
a zener diode electrically between the positive input node of the power socket and a base of the transistor switch; and
a second resistor electrically connected between the base of the transistor switch and the ground node of the power socket;

wherein when the DC voltage exceeding the threshold inputs from the positive input node and the ground node of the power socket, the zener diode is turned on to increase a voltage at the base of the transistor switch so as to turn on the transistor switch; and when the DC voltage below the threshold inputs from the positive input node and the ground node of the power socket, the zener diode is turned off to approximate the voltage at the base of the transistor switch to a voltage at the ground node of the power socket so as to turn off the transistor switch.

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